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GB 2172864 A WO 89/07712 A

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(54) Abstract Title
Fuel-conveying module

(57) A fuel-conveying module (1) comprises a fuel pump (3) for conveying fuel from a fuel tank to an internal combustion engine, a coarse fuel filter (4) which is connected upstream of the fuel pump (3) and a suction jet pump (8). The fuel pump is arranged in a storage pot (2) which has a base (9). A base plate (12) is mounted at a spacing from the pot base (9) in such a manner that a chamber (10) for the reception of the coarse fuel filter (14) is formed between the pot base (9) and the base plate (12), the module being so arranged in the fuel tank that the base plate (12) is seated substantially on a base of the tank.

FIG. 1

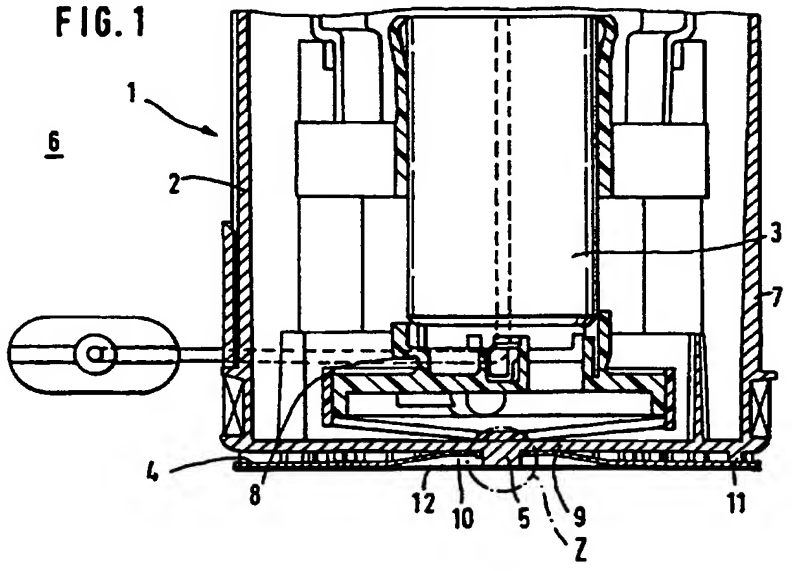

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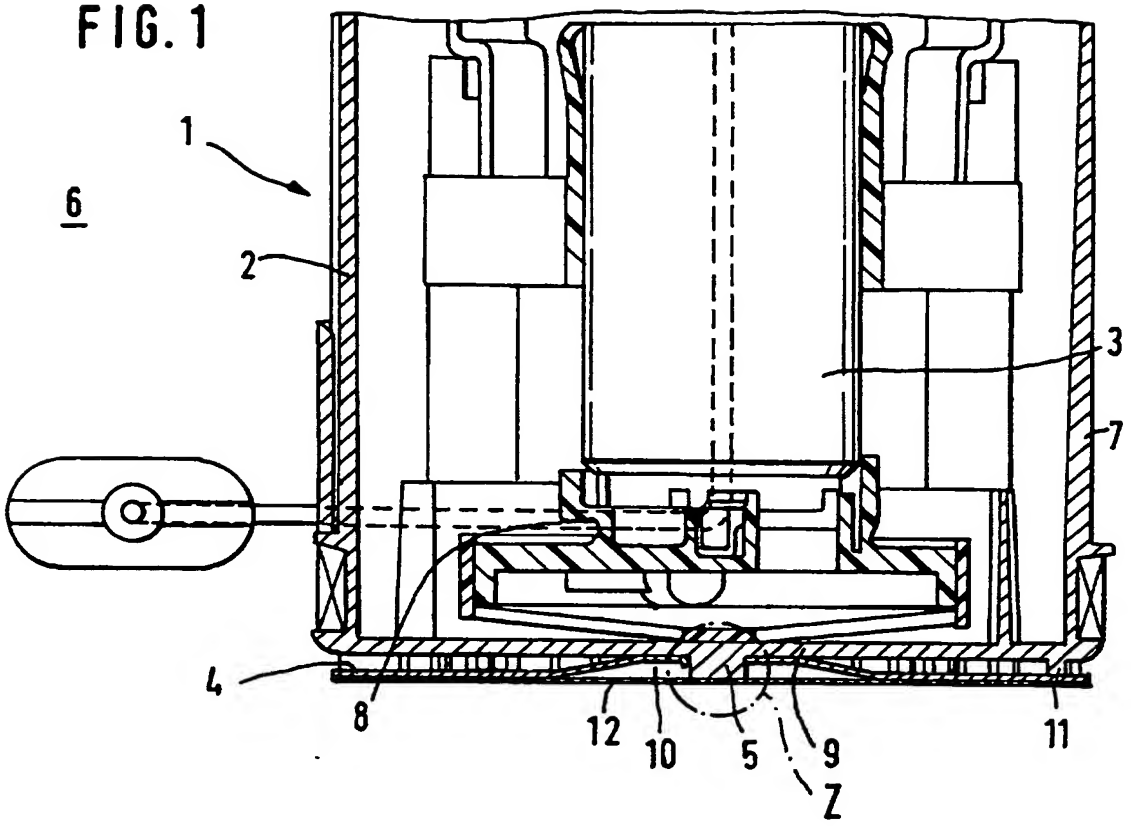
FIG. 1



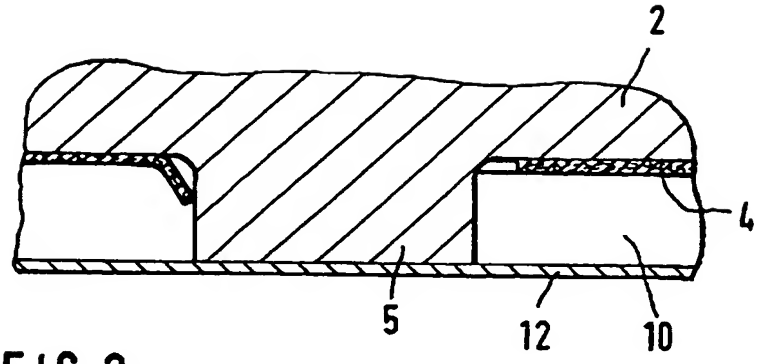


FIG. 2

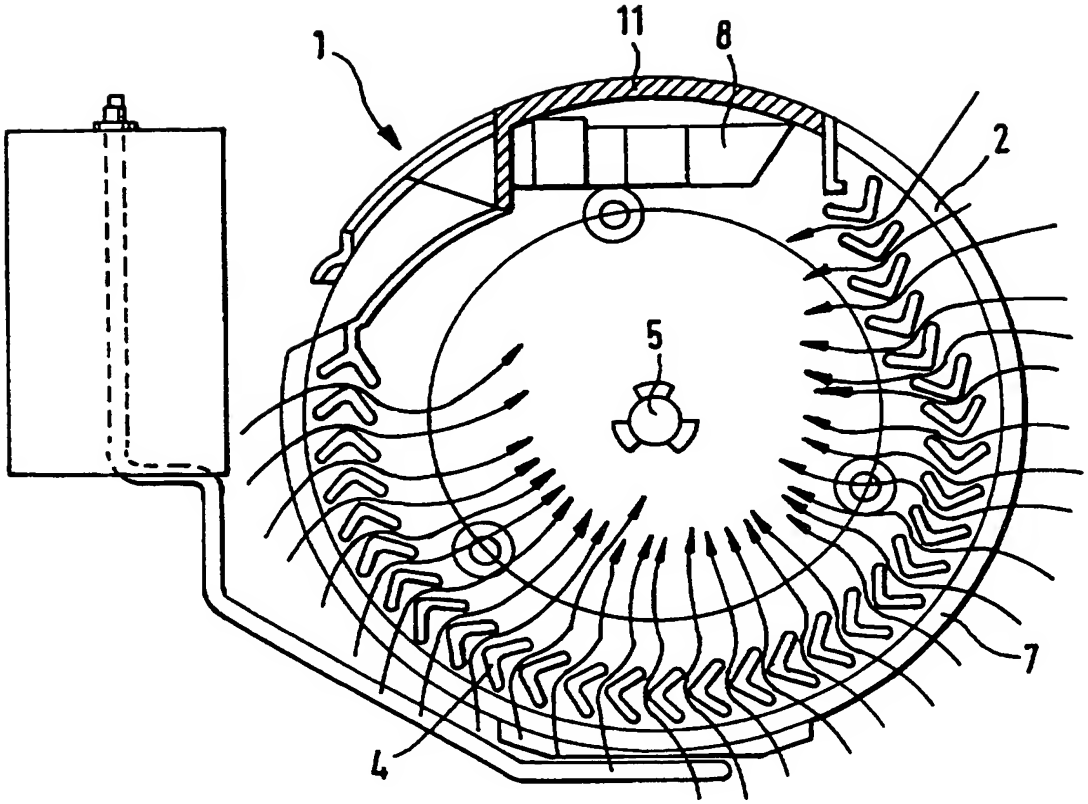


FIG. 3

FUEL-CONVEYING MODULE

The present invention relates to a fuel-conveying module.

In motor vehicles, fuel pumps are used, which are installed in a fuel-conveying module in the interior of a fuel tank. Such a fuel-conveying module is known from, for example, DE 19 615 081 A1. In order to be able to reliably supply the module, which usually sits on the base of the tank, with fuel even when the tank is partially empty, especially in the case of travel around bends and/or on inclines, the fuel pump of the module is installed in a fuel storage pot. By means of the storage pot, fuel is kept at a predetermined level directly around the fuel pump, since the storage pot as part of the module serves as a reserve container. The storage pot is filled from the base of the fuel tank, for example by means of a suction jet pump which can be installed in the region of the pot base. The suction effect of the suction jet pump is caused by an underpressure built up behind the nozzle. The returned fuel not needed by an associated internal combustion engine is utilised for driving purposes. The returned fuel can, however, also be conveyed directly into the storage pot.

The fuel usually flows through two different fuel filters on its path to the engine. The first filter, as a rule a coarse filter, is located at the suction side at the fuel pump integrated into the storage pot. The second filter, as a rule a fine filter, is arranged downstream of the fuel pump and disposed either in the module or externally of the fuel tank.

In addition, a fuel-conveying module with an integrated fine fuel filter is described in DE 19 619 992 A1. This module is seated, by the base of its storage pot, directly on the base of a fuel tank. A coarse filter is arranged in the interior of the storage pot in the suction region of the fuel pump. It is disadvantageous that a connecting element with detent recesses is additionally required for the fastening of the storage pot to the base of the fuel tank. The connecting element can also be integrated into a separate fastener plate, so that the fastener plate, for example with a base seal, forms a mountable base for the storage pot.

A significant disadvantage of a fuel-conveying module according to DE 19 615 081 A1 is that unevenness of the base of the fuel tank has a negative effect on the suction jet pump arranged in the region of the pot base and thereby on the operation of the associated engine if the module emerges from the fuel. This can occur in particular in the case of a

low state of filling of the tank and with the tank disposed in an inclined plane. In particular, bases of fuel tanks of synthetic material can depart from planarity by up to 3 millimetres. According to the unevenness of the tank base, a gap forms between the fuel-conveying module and the base. If the module emerges from the fuel, the fuel flows through the nozzle of the suction jet pump as a free jet and into a mixing tube. The requisite of widening-out of the jet in the region of the mixing tube therefore does not take place. Thus, a leakage forms, because fuel can flow out of the storage pot through the mixing tube around the free jet. Due to a possible gap between the module and the base of the tank, fuel can therefore flow out of the storage pot. A reliable fuel feed to the engine is no longer possible in the case of the pot possibly running dry. The function of a coarse filter installed at the suction side can also be impaired by the unevenness of the tank base.

There is therefore a need for a fuel-conveying module with an improved filling behaviour, which independently of evenness of the base of a fuel tank in which the module is installed ensures a reliable supply of an engine with fuel even if the tank is almost empty or during travel around curves and/or on inclines and which requires no additional fastening elements for the fastening of the module to the tank base.

According to the present invention there is provided a fuel-conveying module with a fuel pump for the conveying of fuel from a fuel tank, which has a base, to an internal combustion engine and with a suction jet pump and a coarse fuel filter, which is connected upstream of the fuel pump, wherein the fuel pump is arranged in a storage pot with a pot base, characterised in that a base plate, which sits substantially on the base of the fuel tank, is mounted with a spacing at the pot base, wherein a chamber for the reception of the coarse fuel filter is formed between the pot base and the base plate.

In such a module, the suction jet pump can be so arranged that an underpressure is generated in the chamber during its operation, so that fuel is inducted out of the fuel tank through the coarse fuel filter without the possibility of flowing past the filter and/or returning fuel not needed by the engine is conveyed again into the storage pot and also has no possibility of flowing out of the pot back into the fuel tank.

In a preferred embodiment, the coarse fuel filter is preferably integrally mounted at the pot base and thus covered by the base plate in the direction towards the base of the fuel tank. The base plate, which by reason of its relatively small size is simple to manufacture as

planar, thus represents an additional base closure of the storage pot, by means of which a reliable function of the coarse filter of the module is ensured independently of any unevenness of the base of the fuel tank.

Preferably, the base plate is substantially parallel to the pot base and has a size or diameter corresponding substantially with the size or diameter of the storage pot.

For preference, the base of the storage pot of the module comprises at least one spigot, preferably in the centre of the pot base, to which the base plate is fastened. Preferably, the base plate is fastened to the spigot by means of a quick-lock connection. This quick-lock connection can be so formed that the base plate is pressed against the spigot or digs slightly into this in order that the base plate is reliably secured to the pot base, which includes the coarse fuel filter, of the storage pot.

Since the base plate is substantially parallel to the pot base, a substantially disc-shaped chamber, which is open over at least a part of its circumference, is formed between the base plate and the pot base, so that fuel can flow substantially radially into the chamber and thereby completely through the coarse fuel filter. In the region of the storage pot, a sealing wall is formed, by means of which this region is closed; thus, in this region fuel cannot flow from outside, i.e. out of the interior of the fuel tank, into the chamber. It is thereby ensured that an underpressure, which serves for the induction of fuel, can be produced in the chamber of the storage pot. Fuel from the fuel tank is inducted entirely through the coarse fuel filter and any fuel which flows back from the engine is fed from the chamber directly back to the storage pot without the possibility of flowing from the pot into the fuel tank and thereby cancelling the function of the storage pot as reserve container.

A fuel-conveying module embodying the invention has the advantage inter alia of better fuel conveying even if the module has emerged from the fuel in the tank, unevenness of the base of the tank being compensated for, or otherwise rendered negligible in significance, by the provided base plate. This means that the base plate on the one hand balances out unevenness of the tank base so that fuel flows through the coarse fuel filter reliably under all conditions without being able to flow past the filter due to a gap otherwise formed by unevenness of the tank base. In addition, an underpressure is produced in the chamber, which is formed between the base plate and the pot base, in consequence of the reliable action of the suction jet pump, whereby fuel, which has flowed from the engine

back into the chamber, is prevented from flowing back into the fuel tank. Rather, this returning fuel is inducted again and conveyed into the storage pot. An optimum supply of an engine with fuel is thus ensured under diverse conditions of use of a motor vehicle, including the case of an almost empty fuel tank and/or the case of the vehicle being situated on an incline.

An embodiment of the present invention will now be more particularly described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a sectional elevation of part of a fuel-conveying module embodying the invention;

Fig. 2 is a detail view, to enlarged scale, of the area Z of Fig. 1; and

Fig. 3 is a cross-section of a coarse fuel filter of the module and related components of the module

Referring now to the drawings there is shown in Fig. 1 a fuel-conveying module 1 comprising a storage pot 2 with a wall 7 and a base 9, the storage pot 2 being cylindrical in shape. The pot 2 can be produced, for example, of a fuel-resistant synthetic or plastics material or of metal. A coarse fuel filter 4 is mounted at the pot base 9. A spigot 5, to which the filter 4 is fastened, is provided in the centre of the pot base. It is, however, also possible for the filter 4 to be cast or moulded directly into and integrally with the outward side of the pot base 9.

The side of the storage pot 2, which is provided with the coarse fuel filter 4 and faces the base of the fuel tank 6 is covered by means of a base plate 12. The base plate 12 is fastened to the spigot 5, for example by a quick-lock connection, of the storage pot 2. This base plate 12 can be formed of aluminium, steel, synthetic or plastics material. The base plate 12 is arranged parallel to the base plate 9 and at such a spacing therefrom that the coarse fuel filter 4 is received between the base plate 12 and the pot base 9. This intermediate space, which receives the filter 4 between the pot base 9 and the base plate 12, forms a chamber 10. The chamber 10 is formed as an annular chamber and is open over a part of its circumference to the fuel tank in the region of the base thereof. In the region of the fuel-conveying module, in which the suction jet pump 8 is arranged, the

chamber 10 is closed in the direction towards the fuel tank 6 by an annular web encircling part of the circumference and forming a sealing wall 11. A suction jet pump 8 in the pot 2 is capable of producing an underpressure in the chamber 10 to ensure that the fuel is either inducted from the fuel tank 6 through the filter 4 into the chamber 10 or that returning fuel not required by an associated internal combustion engine can be conveyed out of the chamber 10 directly into the interior of the pot 2 without this returning fuel having the possibility of flowing out of the chamber 10 back into the interior of the fuel tank 6. It is thus ensured by the arrangement of the base plate 12 that all inducted fuel can only flow through the coarse fuel filter and flowing past the filter due to unevenness in the base of the fuel tank 6 is thus avoided, since a possibly present gap between the base plate 12 and the actual base of the fuel tank 6 is of negligible significance for the flowing of the fuel into the chamber 10 through the filter 4.

Fig. 2 is an enlarged sectional view through the region of the pot base 9 with the spigot 5. The base plate 12 is fastened flushly to the end of the spigot 5, so that the chamber 10 is formed between the base plate 12 and the actual underside of the pot base 9. The coarse fuel filter 4 is fastened to the spigot 5 by means of, for example, a pressed connection (righthand side in Fig. 2) or by means of a quick-lock connection (lefthand side of Fig. 2). The thickness of the filter increases in radially outward direction from the region of the spigot 5 in such a manner that the spacing between the underside of the pot base 9 and the base plate 10 is filled out completely by the filter over substantially the radial region of the chamber 10. The spigot 5 thus forms a detent for the fastening of the filter 4 as well as for the base plate 12 for their quick-lock connection with the base 9 of the pot 2. The base plate 12 can also be connected with the spigot 5 by a screw connection, a shrunk connection or a heat deformation.

Fig. 3 is an axial sectional view through the region of the filter 4. The cylindrical shape of the storage pot 2 is evident in Fig. 3. The filter 4 extends over part of the circumference between the pot base 9 and the base plate 12 and is absent in the region of the module in which the suction jet pump 8 is arranged. In this region, the sealing wall 11 extends from the underside of the pot base 9 to the base plate 12, so that the chamber 10 formed in the interior between the pot base 9 and the base plate 12 is closed outwardly in the direction towards the fuel tank 6 in the region of the suction jet pump 8.

The suction jet pump 8 produces an underpressure in the chamber 10 so that the fuel flows substantially radially through the filter 4 and coarse particles cannot pass into the module 1. The base plate 12 thus has the effect that any that unevenness present in the base of the fuel tank 6 cannot lead to a gap between the filter 4 and the base of the fuel tank 6, through which unfiltered fuel can reach the interior of the fuel-conveying module. The throughflow direction of the fuel through the elements of the filter 4 is indicated by the arrows. The spigot 5 for the fastening of the filter 4 and/or the base plate 12 is provided in the interior of the chamber 10. The elements of the filter 4 can also be connected integrally with the pot base 9, i.e. moulded or cast onto the base. These elements of the filter, which bridge over the spacing between the pot base 9 and the base plate 12, therefore have the same height, so that the base plate 12 in the mounted state lies substantially against all elements of that kind.

CLAIMS

1. A fuel-conveying module for a fuel tank, comprising a fuel storage pot with a base, a base plate which is mounted at a spacing from the pot base to form a chamber therebetween and which is intended in use to be substantially seated on a base of the tank, a coarse fuel filter arranged in the chamber, a fuel pump arranged in the pot to be downstream of the filter, and a suction jet pump.

2. A module as claimed in claim 1, wherein the filter is mounted integrally at the pot base.

3. A module as claimed in claim 1 or claim 2, wherein the base plate is substantially parallel to the pot base and has a diameter substantially corresponding with that of the pot.

4. A module as claimed in any one of the preceding claims, wherein the base plate is fastened to at least one spigot at the pot base.

5. A module as claimed in claim 4, wherein the base plate is fastened to at least one spigot by quick-lock connecting means.

6. A module as claimed in any one of the preceding claims, wherein the chamber is substantially disc-shaped and open over part of its circumference to substantially radially oriented inflow of fuel into the filter.

7. A module as claimed in claim 6, wherein the chamber is closed in the region of the suction jet pump over part of the chamber circumference between the base plate and the pot base to enable generation in the chamber of an underpressure for induction of fuel.

8. A fuel-conveying module substantially as hereinbefore described with reference to the accompanying drawings.

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Application No: GB 9917441.9
Claims searched: 1 - 7

Examiner: Tom Sutherland
Date of search: 12 October 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): B7H (HLB, HLH)

Int Cl (Ed.6): B60K 15/077

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2172864 A	(PIERBURG) See the figures, intermediate chamber 4.	1 & 2
X	WO 89/07712 A	(VOLKSWAGEN DO BRASIL) See Figs. 2 and 3.	1 to 4

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.